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COUNTRY	Hungary	REPORT NO.	25X1
SUBJECT	Comments on the New (1951) Procedure for Calculating Construction Safety in Hungary	DATE DISTR.	August 2, 1958
		NO. OF PAGES	1
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COUNTRY: Hungary   25X1

SUBJECT: Comments Concerning the New (1951)   NO. PAGES: 3
                Procedure for Calculating
                Construction Safety in Hungary   REF: 25X1

                                                                               25X1
     1. [   ] the safety factor in engineering construction   25X1
is of great importance since it involves human life, but exaggerated safety
controls are both unreasonable and uneconomical. Constructions must be
safe and economical to be of merit; therefore, engineers are faced with
the problem of developing equipment to meet these two prime requirements.

     2. Generally, a construction is considered safe if it can sustain
twice the load for which it had been constructed. This applies to all con-
structions with the exception of machines -- particularly their rotating
parts -- where a safety factor up to 10 is required. Following is an
example in which a steel railroad bridge is used to illustrate the calcula-
tion of construction safety in Hungary prior to 1951: If it is known that a
bridge was designed under provision of a double safety factor, one assumes
that the bridge is able to carry twice the weight of the permissable live
load. In reality, however, this premise is incorrect since the bridge would
not actually collapse until the load reached about 2.3 times the weight of
the permissable load. That the premise is incorrect is due to the inac-
curate calculating system used. In this system the double safety factor
for the total amount of both the live load and dead load was used for the
calculation but, actually, it is only the live load which increases while
the dead load remains the same. Thus, in calculating safety which involves
the total live load and dead load, heavy constructions actually have a
greater margin of safety than do light constructions. Developing this idea
further, it is apparent that the actual margin of safety of the various
parts of a construction such as the main beam, cross beam, etc., is not the
same but varies according to the dead load of the part. An increased
margin of safety for certain parts of a construction has no practical
effect, however, because the over-all safety of the entire construction
depends on the safety of the parts which have the lowest dead load.

     3. [   ] the following method which was   25X1
introduced in Hungary in 1951 is more exact from a technical point of view:
In order to ascertain the total load, the forces caused by the live load
are multiplied by the safety and dynamic factors; then the value of the
forces caused by the dead load is added to this amount. In this calcula-
tion, the dead load is provided with a certain safety provision; however,
in order to arrive at the certain safety provision for the construction
against the forces caused by the dead load, it is not necessary to multiply
the dead load with the same safety factor used for the safety provision of
the live load. Conversely, safety is provided against the forces caused
by the dead load when the theoretical weight of the structure is increased
or decreased by ten percent. Ten percent is added to the weight of the
structure if the live load causes the same type of charge (tension or com-
pression) in the structure as the dead load; ten percent is subtracted if
the live load produces the opposite type of charge as the dead load. When
the live load causes a variable type of charge in a particular part of the
construction (sometimes tension, sometimes compression; i.e., in the grids
of a trussed beam) the theoretical weight of the part is decreased or
increased by ten percent so that the particular part can meet the type of
charge which causes greater forces.

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4. Following is the mathematical expression of the new method intro-
duced in Hungary in 1951 and described in para. 3, above:

$$Y_L = v \cdot Y_d + n_1 \cdot n_2 \cdot Y_1$$

$$n_1 \cdot n_2 \cdot Y_1 = Y_L - v \cdot Y_d$$

$$n_1 = \frac{Y_L - v \cdot Y_d}{n_2 \cdot Y_1}$$

Y_L is the "limit charge" - the total value of the dead load and live load
under provision of a given safety and dynamic effect.

v is the multiplying factor for the dead load. (o.9 or 1.1)

n_1 is the given live load safety factor

n_2 is the given dynamic factor

Y_1 is the charge caused by the live load

Y_d is the charge caused by the dead load.

5. In the old (prior to 1951) method of calculation -- which is now
obsolete in Hungary -- were applied, the stresses caused in different parts
of the structure would be checked instead of the safety of the different
parts. The safety factor was ostensibly determined by the value of the
working stress which, in turn, was a certain proportion of the ultimate
strength. In practice, however, there was no way to measure the stress of
the construction; the stretch of the material subjected to load was measured
instead of the stress. Therefore, it is more logical to give the capacity
of a construction in value of permitted forces caused by the load rather
than in stresses; i.e., to give the capacity in kilograms or tons instead
of in kg/cm^2. since it is easier to measure the force. For a practical
application of this theory, it was necessary to introduce a new idea -- the
so-called "limit stress". The limit stress is the greatest stress to which
material could be subjected without damaging deformation of the material.
This new method, introduced in 1951, omitted all calculations involving
working stress.

6. In the new method of calculation the value of the limit stress for
plate girder beams made from 36/24/12A steel (36 $kg./mm^2$ represents the
ultimate strength; 24 kg/mm^2 is the proportional limit, and 12A is the
designation number - - this is one of the standard types of Hungarian
steel) is $S_L = 1,950$ kg/cm^2. (S_L, the American equivalent for that which
the Hungarians express as ΣL, represents the limit stress.) The value of
the limit stress for trussed constructions made from the same type of
steel is $S_L = 1,850$ kg/cm^2. The working stress in both types of construc-
tions made from the above-mentioned steel is 1,400 kg/cm^2. The limit shearing
stresses in rivets: $S_s = 0.7 \cdot S_L$. The bearing stress on rivets: $S_b =
2.0 \cdot S_L$. The limit capacity of a particular part of a construction is
determined by multiplying the cross section of the part by the limit
stress. In compressed constructions, the limit stress is referred to as
limit buckling stress.

7. In order to determine whether or not a particular part of a con-
struction has sufficient strength to carry the maximum load under a given
safety provision, the limit charge of the part is compared with the limit
capacity of the part. The part is sufficiently strong if the value of its

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limit charge is lower than the value of its limit capacity. The basic formula
of the new method is that only the forces caused by the live load are multi-
plied by the safety factor and the safety factor of the part is determined
rather than the stresses caused in the part. The safety factor varies for
various types of constructions and corresponds with the regulations issued
for a particular type of construction. The safety factor for railroad
bridges was 1.4; for highway bridges, as well as various other civil engineer-
ing constructions, the safety factor was 1.5. The value of the dynamic
factor varies from 1.4 to 1.6 according to the span of the bridge.

8. [   ] if the new method for calculating construction
safety is applied, all the parts of a particular construction have the same
capacity and the same safety. Furthermore, the new method results in
saving of materials without sacrificing the safety of the construction.
Relatively more material is saved in constructions which have a greater dead
load. Finally, from a military viewpoint, the ultimate capacity of a con-
struction can easily be determined in an emergency.

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